patient to receive not only exact and meticulous care, but expert care also.

In another paragraph the doctor suggests imperfect reduction as playing the most important rôle in nonunion.

On our service at the Los Angeles County General Hospital the Smith Peterson pin was tested on a number of patients. This method necessitates an anesthetic for reduction and application, but the patient may be allowed any degree of motion in bed afterward that would be permissible with any other type of splint. Thus far, with this pin method the results have been very promising. To my mind, that method helps solve the problem that I believe is the cause for more nonunions than any other thing and that is, blood supply; and certainly these patients are very comfortable. At the General Hospital we have been unfortunate with the Doctor Jones splint or our method of application has been faulty, for our results have been exceedingly unsatisfactory. The Jones splints are at times applied by the residents on the orthopedic services, who are men of as much training and experience in this orthopedic work as the average general practitioner, and it would seem to me that if the residents are unable to apply this splint, probably the general practitioner might at times also have difficulty.

Nevertheless, I believe that Dr. Jones's splint is a very definite addition to our armamentarium for the treating of fractures of the neck of the femur. However, just as much skill, time, and care must be used with his splint as with any of the other accepted methods of treatment. In this work it is necessary to know the various methods of treating these fractures. Then one can select the procedure which seemingly best suits the particular case.

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E. W. Cleary, M. D. (490 Post Street, San Francisco).—I began to use the Jones splint as soon as I saw it and could get one. Since then, up to date, all my femur fractures have been intertrochanteric. Two are recovered. A woman of eighty-seven who had a badly comminuted intertrochanteric fracture has a firm union with no shortening or deformity. I think she would have died if we had put on a Whitman cast; traction would have been difficult and uncertain, and open reduction was out of the question.

Intracapsular fractures of the femoral neck should be even more efficiently reduced and held by this appliance than the intertrochanteric type. No method, not even the best operative reductions, has yielded any near approach to 100 per cent recovery in high subcapital fractures, so far as I know. A large percentage of such lesions occur to aged and feeble individuals. A method which accomplishes positive reduction and positive maintenance in the reduced position with a minimum degree of restraint and shackling of the patient is a boon alike to patient, doctor, and nurse. The Jones splint can do this.

In the hands of competent and painstaking surgeons it is very much worth while, but it must not be expected to do the impossible. While the splint is on I keep all my patients either on a fracture bed or a Bradford frame; otherwise, handling of the patient in cleansing the skin or using the bed pan may defeat the object of the treatment.

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James T. Watkins, M. D. (909 Hyde Street, San Francisco).—I am familiar with Doctor Jones's appliance and can say without hesitation that it is exceedingly efficient in the treatment of certain fractures, particularly fractures of the pelvis with displacement of the fragments. Here I know of nothing that can compare with it.

Doctor Jones is quite right in his assertion that imperfect reduction plays the most important rôle in nonunions of the femur. In communities where a stereoscopic x-ray can be employed to obtain exact information regarding the relations of the fragments after attempted reduction, I believe that there is no excuse for failing to get an accurate reduction.

The technique of Doctor Whitman's procedure should be very well known to everyone who proposes to treat these fractures. Indeed, there is no excuse for not knowing it. It ought not to be hard to remember the several steps: (1) Make traction until the legs are equally long. (2) Rotate the injured leg inward. (3) Maintain this position and abduct the good leg admaximum and then abduct the injured leg to the same extent. (4) Then slightly hyperextend the injured leg. (5) In the position so obtained apply plaster of paris from toes to axilla. Once the fragments are properly locked they stay locked.

A little over a year ago I attempted reduction of a fracture of the femur. The stereoscopic x-ray had shown it was not satisfactory, so I repeated the procedure—this time successfully—and shortly afterward sent her home to New York in a Pullman section, referring her to Doctor Whitman. His x-rays showed the relations of the fragments unchanged, and the cast was left intact. She assured me recently that her leg was now as good as it had ever been.

Whether Doctor Jones's appliance will supplant the Whitman method I cannot say. It can be said, however, that it presents certain distinct advantages since, as Doctor Jones points out, old and enfeebled persons, who do not take kindly to protracted periods of lying in bed, can be placed in a sitting position as soon as the Jones apparatus has been applied.

ROENTGEN DIAGNOSIS OF TRACHEO-BRONCHIAL AND PULMONARY TUBERCULOSIS—ITS VALUE*

By Merl L. Pindell, M. D.
Los Angeles

Discussion *by Ray A. Carter, M. D., Los Angeles; Chesley Bush, M. D., Livermore; A. C. Siefert, M. D., Oakland.*

In this paper the early discovery of pulmonary tuberculosis and the significance of roentgen diagnosis will be chiefly stressed, and the methods of procedure in the Los Angeles County Health Department will be outlined.

The Department has started a ten-year program (two years of which have passed), coöperating with the Los Angeles County Tuberculosis and Health Association, the latter of which has charge of the sale of Christmas seals in the nonmetropolitan areas of Los Angeles County. The program referred to is commonly spoken of as "the contact program," as many of the patients selected for examination are living in a family where there is a case of pulmonary tuberculosis. However, the majority of the children selected for examination are first given a Mantoux test.

When geographical area and population are considered, this is a very extensive program. Professor Ira Hiscock, of Yale University, estimated conservatively that there are 18,000 close contacts in the Health Department's territory. A program of this character demands a large personnel, especially an efficient nursing service, which is derived from seventy-six full-time nurses and many part-time nurses in the Los An-

* Read before the Radiology Section of the California Medical Association at the fifty-ninth annual session at Del Monte, April 28 to May 1, 1930.

geles County Health Department. The Tuberculosis Division consists of one chief physician, full time; three clinic physicians, full time, and twenty-one consulting physicians, as needed.

The highest mortality from tuberculosis in the state of California at the present time is in the age group of from fifteen to twenty-five years; so it is easy to understand why we are stressing the early recognition of this disease, especially in children.

Tuberculosis is still the most expensive disease of civilization, costing the United States alone over $500,000,000 annually. Out of our population of 110,000,000 citizens, 9,000,000 are doomed to die of this disease, unless we do better in fighting it than we have in the past.

Statistics show that tuberculous people, who had come in contact with health propaganda, were in the earlier stages of the disease; and therefore had a better chance to get well than the people who were not so fortunate as to have become familiar with such health education.

PHYSICAL FINDINGS VS. X-RAY FINDINGS

The writer's viewpoint as to the value of x-ray in the diagnosis of pulmonary tuberculosis is in line with the outline in the "Diagnostic Standards" edited by the National Tuberculosis Association, from which I will quote:

"Radiological Findings.—Definite parenchymal changes are seen in nearly all instances of proven pulmonary tuberculosis. Absence of such changes demands other proof of the existence of the disease."

"Physical Findings.—Pulmonary tuberculosis may exist without the occurrence of demonstrable physical signs. Absence of abnormal physical signs does not mean, therefore, absence of pulmonary tuberculosis."

Some time ago I heard a physician, from one of our large insurance companies, analyze one thousand cases of pulmonary tuberculosis. His conclusions were that many of these patients had the disease when passed as sound by the medical examiners of the company. But what are the companies doing about it?

The insurance companies could save thousands of dollars and be of greater benefit to mankind by including x-ray of the chest in their medical examinations.

We are falling down on the early diagnosis of pulmonary tuberculosis. We are waiting for the patient to come to us with symptoms. At such a time as this, in the preponderance of cases, it is too late to effect a cure. Here, I wish to cite a case to emphasize the importance of examining contacts, and the folly of depending too much on clinical information.

A young high school girl, fifteen years of age, was examined because she was a contact to her brother. She was a well-nourished girl, with normal temperature and pulse. She played basketball without becoming fatigued. The examination by x-ray revealed a large cavity in each apex; and fairly dense, bilateral upper-lobe mottling. The physical examination revealed râles in both upper lobes, but missed the cavities. This girl died in less than a year. Her parents and the educational authorities could not be convinced that she was in a critical condition. I have seen many physicians with the same turn of mind, so we should not condemn the parents or the teachers too severely.

Inasmuch as there are many times no characteristic symptoms nor signs of the disease, we must rely principally upon the history of household exposure to open cases of tuberculosis. In the County Health Department work the sensitiveness of the tuberculin test in selecting children for examination is taken into full account.

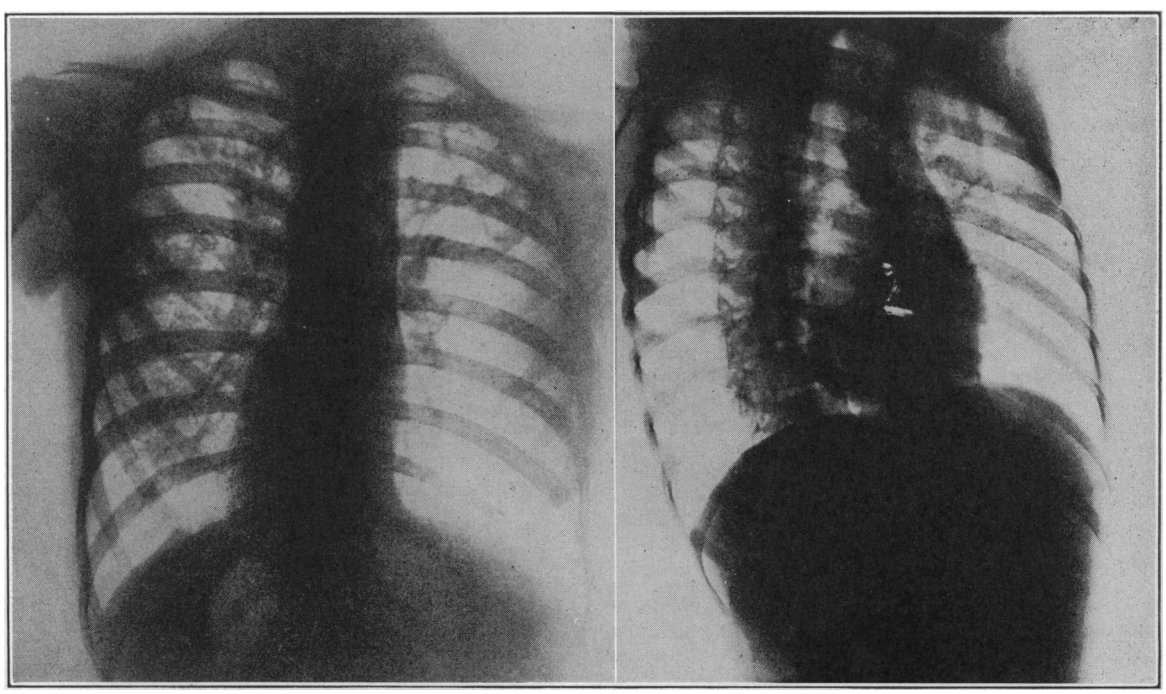

Fig. 1.—High school girl, age 15 years. Well nourished girl with normal temperature, who took strenuous exercise without fatigue. Contact to brother. Film revealed large cavity in each apex.

Fig. 2.—Female patient; age, eight. Positive Mantoux test. Close contact. No physical signs nor clinical symptoms.

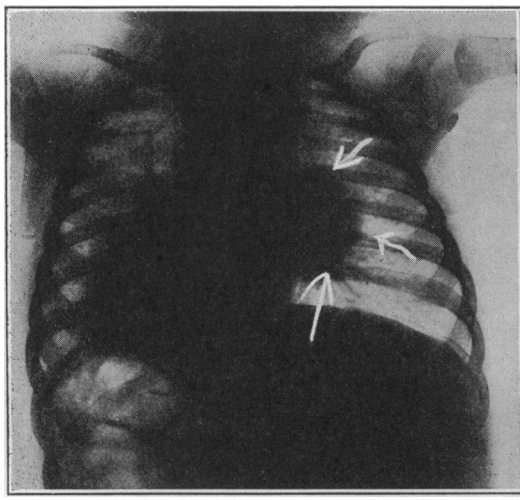

Fig. 3.—Male patient; age, eight months. Father is a hemorrhage case, and is now in the hospital. Film reveals Ranke's complex (early pulmonary lesion with enlarged secondary tracheobronchial lymph nodes). After one year's rest, the abscess has entirely disappeared and the tracheobronchial involvement is becoming calcified.

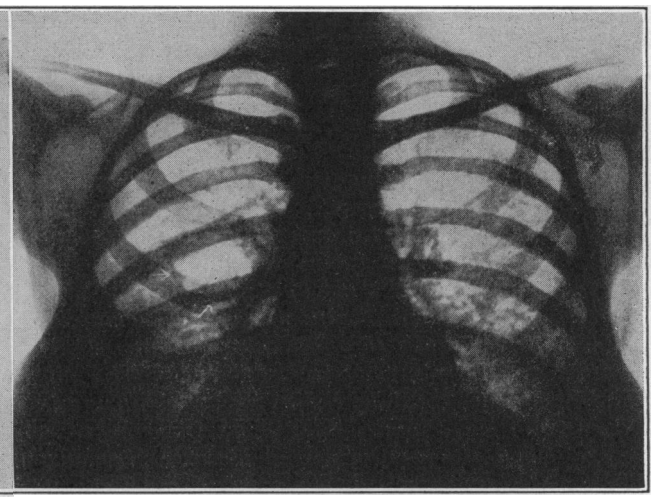

Fig. 4.—Female patient; age, seventeen. Very positive Mantoux. Physical examination revealed a few crepitant râles over the left base anteriorly, and a few coarse râles over the right base, following cough. No signs of cavitation were present.

EXAMINATION OF HIGH SCHOOL STUDENTS

About a year ago, by x-ray and physical examination, 197 high school children were examined. Of these 113 were girls and eighty-four were boys. Only 30 per cent were contacts. Twenty-six were 15 per cent or more underweight, and of these 77 per cent were girls. Two cases of pulmonary tuberculosis were found. One was far advanced and the other minimal. The minimal case had no clinical symptoms nor physical signs, and was revealed by x-ray only. Eleven cases of tracheobronchial tuberculosis were found. Five patients of this group were boys and six were girls. Tuberculosis diagnoses amounted to thirteen or 6.6 per cent of the total number examined.

EXAMINATION OF SUMMER HEALTH SCHOOL STUDENTS

X-rays were taken of 304 children in the summer health schools during the summer of 1929. Of these 166 were reported to be contacts; the rest were 15 per cent or more underweight. There were twenty-one cases of tracheobronchial tuberculosis, and three cases of minimal pulmonary tuberculosis. Tuberculosis diagnosis constituted 7.6 per cent.

DIAGNOSIS OF TRACHEOBRONCHIAL TUBERCULOSIS

The clinical signs of tracheobronchial tuberculosis are confusing, to say the least. In the writer's opinion, the overwhelming majority of these patients do not have any clinical symptoms or physical signs; and underweight or malnutrition as an indication of tuberculous infection or latent disease is not to be depended upon. If many patients, who have cavities in their lungs, are up to normal in weight, and have no clinical symptoms, what can we expect a few localized or calcified glands to reveal? Of course, massive infection and extreme enlargement of these glands do cause symptoms and produce physical signs.

Underweight and clinical symptoms are common to many children who do not have tuberculosis. A child may be thin because he is very active, or active because he is thin. I know of a woman who gained ten pounds, while a definite and quite extensive, nodular, basal infiltration was developing in her good lung, certainly fooling a good clinician. It is the writer's belief that the x-ray is the only reliable method in the diagnosis of tracheobronchial tuberculosis, but it surely exists without demonstrable calcifications. Extensive research has demonstrated that these calcifications represent definite tuberculous infection, and in most of our cases there has been a contact history and a positive tuberculin test.

When the contact program work was first started, the writer was very enthusiastic about it and trained his technicians to place the patient so as to show the bifurcation of the trachea, as this is a favorite location for calcifications. The exposure time was increased in order to obtain good contrast and we demonstrated some beautiful calcifications that were not shown in the straight position. True calcifications must not be mistaken for blood vessels axially radiated. This mistake is being made by a great many physicians and of course denotes inexperience. Now, of what significance are these findings? The writer is not yet convinced of their great importance in causing pulmonary tuberculosis, and, of course, we rarely hear of a patient dying of tracheobronchial tuberculosis. The writer still clings to the old viewpoint that calcifications anywhere in a tuberculous patient are an indication of a healing process. If this be true, might these calcifications in the intrathoracic lymph nodes without other evidence of the disease be an asset instead of a liability to the individual who has them?

When such patients as these are taken out of their infective environment, very few ever get pulmonary disease. It is, however, important to diagnose these calcifications, if for no other reason than to check the father and mother of such a child for the possible source of infection.

The uncalcified and massive enlargement of these glands is more serious. They are shown on the roentgenogram by irregular densities projecting from the upper mediastinum or hilum. (However, Fig. 3 also shows a pulmonary lesion.) They must not be mistaken for movement of the heart and shadow of blood vessels. The writer has changed his mind about the non-tuberculous enlargement of these glands, and now considers all enlarged intrathoracic lymph nodes in a child as tuberculous. All these early lesions diagnosed in childhood should show positive tuberculin reaction.

EARLY PULMONARY LESIONS

The only time that tuberculosis has a marked tendency to heal is in the earliest stages, when it is localized; therefore, this is the time at which it should be diagnosed, and the x-ray ranks supreme in showing these early lesions. There is no secret in the accuracy with which the x-ray depicts dense tuberculous lesions, but there is probably an art in being able to distinguish slight, fine, tuberculous mottling in the lung from the normal lung markings. Roughly speaking, any confluent densities or discrete, fine mottling; or coarse nodular infiltration in the upper half of the lungs of an adult should be considered tuberculous until proven otherwise. These markings must be entirely distinct from the linear markings of the lungs. Most of the lesions located in the lower half of the lungs should be considered non-tuberculous until proven otherwise. But many times characteristic nodular densities are observed in the bases and, of course, represent tuberculosis.

Definite annular shadows in the upper half of the lungs should be considered tuberculous cavities until proven otherwise. If these annular shadows are located in the lower half of the lungs and show a distinct wall outline, they also should be considered tuberculous cavities until proven otherwise.

CHILDHOOD TYPE OF TUBERCULOSIS

Pulmonary tuberculosis in childhood can occur anywhere in the lungs, and is caused by a primary infection and the tracheobronchial glands are always affected; while the adult type in childhood is secondary or the result of reinfection, and the tracheobronchial lymph nodes are seldom involved. The former, which may be depicted at times by a massive allergic reaction, has a better outlook than the latter, and heals more by resolution than by fibrous transformation. Small perifocal lesions have a good prognosis.

Miliary tuberculosis occurs chiefly in infants and is depicted on the roentgenogram as universal, fine, speckled mottling and has an unfavorable prognosis. However, if such patients do not develop meningitis many get well.

We have been criticized for being too dogmatic in reporting the stages of tuberculosis. For instance: minimal, moderately advanced, far advanced. Who could describe with more accuracy the anatomical location and distribution of tuberculous lesions, the size and location of cavities, better than the roentgenologist? Of course, we do not attempt to classify them as to "A," "B," and "C," as these are based entirely on clinical symptoms and physical signs, which I do not think are satisfactory. A better classification is based on whether we are dealing with an exudative or productive lesion.

The writer is still to be convinced that physical examination and clinical symptoms can tell whether a patient's disease is arrested or not. They may say the disease is arrested, but that does not make it so. The writer is skeptical enough to believe that so long as x-ray depicts densities that are not completely fibrosed, that such a patient still has tuberculosis. It may be latent, but it is dangerous.

A report from the United States Veterans' Bureau for the year of 1927 stated that of the patients discharged with a diagnosis of arrested or apparently arrested tuberculosis 75 per cent gave evidence of activity within one year after discharge. Were the patients arrested when discharged?

BELIEFS CONCERNING TUBERCULOSIS

The ancient conception of tuberculosis was that a patient must be extremely emaciated to have consumption.

The medieval conception of tuberculosis was that the tubercle bacilli must be present in the sputum, and that there must be clinical symptoms and physical signs of the disease.

The modern conception of tuberculosis stresses the importance of early diagnosis, at which time many patients have no clinical symptoms nor physical signs, and are diagnosed principally by Roentgen examination.

The writer maintains that any person of any age (positive Mantoux in children) who shows by x-ray examination a fairly characteristic and persistent lung infiltration that is not encapsulated in the apex, not completely fibrosed nor resolved, should be considered as having pulmonary tuberculosis, and as such is dangerous and should be treated. The common acceptance of "activity" as it relates to pulmonary tuberculosis is many times irrelevant; so mankind might be more benefited if the word should become obsolete.

Basal lesions, we all know, are treacherous. They may exist for years without noticeable impairment of health. Eventually, however, a great majority of these, if unrecognized and untreated, will develop into manifest disease. For two years the writer has had a nurse under observation who had no clinical symptoms nor physical signs, but who did have a small, definite basal density which suddenly flared up with many clinical symptoms, positive sputum, et cetera. An x-ray examination revealed quite an extension

of the process in the base with evidence of breaking down of the lung. To repeat what has been said before, densities in the lung that are shown by x-ray should be treated regardless of the absence of clinical symptoms or râles.

Knowing that criticism must be constructive to merit consideration, he would make his suggestions accordingly. It requires a great deal of experience to interpret x-ray films properly. The greatest error the writer made in the beginning, and which he knows has been made by others, is that of reading too much in the film and not being able to distinguish between the films of a healthy chest and that of a diseased one.

It has just been lately that he has been able to distinguish, with a fair degree of accuracy, between a normal and abnormal lung radiograph. This art, if you wish to call it that, requires seeing the films of thousands of normal chests of all ages, and thousands of abnormal chests of all ages, with autopsy checks. Clinicians are not to be blamed for doubting or scoffing at some of the reports they receive. The writer has been guilty many times of writing too much in his x-ray reports. Let us be more brief in our reporting. The clinicians are not interested in minute technical descriptions. An elaborate report might interest other radiologists, but how many of our reports are seen by them? The clinician merely wishes an opinion. He does not care to know if the hilum is one-half millimeter larger than you think it should be; or that a certain linear marking comes within a millimeter of the summit of the apex; or that the mediastinum is one-half millimeter enlarged; or that the right dome of the diaphragm is irregular. Such descriptions as these should be eliminated.

Densities in the lung, or encroaching on the lung, of course, should be fully described, as to location, distribution, size, character, etc. If dealing with tuberculous lesions we should state whether caseation or fibrosis is predominating; size, character and location of cavities and whether, in your opinion, pneumothorax would be advisable. A note of warning about interpreting lesions as fibrous. Purely fibrous lesions, in the writer's opinion, are uncommon.

CONCLUSIONS

1. The feasibility of a health department undertaking the education of the public about tuberculosis and starting a campaign for its early recognition, cannot, in the writer's estimation, be questioned.

2. Early pulmonary tuberculosis and latent pulmonary tuberculosis, the diagnosis of which is so essential and which is so many times overlooked on physical examination can practically always be diagnosed by roentgen examination.

3. More attention should be paid to the anatomical lesions, that is, definite densities shown by x-ray; and less attention should be paid to temperature, pulse and râles.

4. All children that are contacts or have a positive tuberculin reaction should be x-rayed.

5. From a public health standpoint, x-ray plays a vital part in our campaign against tuberculosis.

6. The time has now arrived for the public to demand x-ray examinations of the chest when applying for periodic medical examinations.

678 South Ferris Avenue.

DISCUSSION

RAY A. CARTER, M. D. (1100 Mission Road, Los Angeles).—A clearer conception of the pathology and pathogenesis of pulmonary tuberculosis has helped to clarify roentgen diagnosis, particularly in children. It has also helped to focus attention upon the rôle played by contact infection in childhood. This infection must be recognized and prevented if tuberculosis is to be successfully combated. It is encouraging that elaborate public health programs, like this outlined by Doctor Pindell, are under way.

The roentgen ray examination is a major factor in such a campaign. It is true that the film often demonstrates anatomic symptoms, especially in latent cases. Occasionally, rapidly progressive lesions are shown with little evidence aside from the film. Therefore, routine films will be indispensable in a thorough campaign of tuberculosis prevention and should be made of all contact and tuberculin positive children.

The positive roentgen evidence of tuberculosis is strong. Disguised by discrepancies of terminology, one can see fair agreement as to fundamental pathology and roentgen appearances it will produce. There are differences of opinion as to prognosis, severity of involvement and pathologic detail. These can usually be resolved in light of other evidence.

Concerning the negative use of the film, I cannot yet feel so sure. Public surveys mean a tremendous volume of work, usually overtaxing any capacity which can be developed to meet it. This leads to an imperative demand, expressed or implied, for some routine agency, not only to single out cases for special attention but also to eliminate others.

Will properly taken negative films eliminate the disease in a contact or tuberculin positive child? Doctor Pindell quotes from the National Tuberculosis Association that "definite parenchymal changes are seen in nearly all instances of proven tuberculosis." McPhedran said of roentgen examination that it would "almost without exception reveal any lesion that is clinically significant." In the same article he established that uncalcified glands of tracheobronchial tuberculosis are not recognizable unless large and therefore will not be seen in a majority of cases. He also demonstrated that parenchymal lesions may be missed on the usual views.

May we assume that these lesions are not clinically significant in a prevention program? It seems reasonable that there should as yet be some conservatism in the use of the film to eliminate tuberculosis.

I share Doctor Pindell's distrust of apparently arrested or inactive lesions. "Activity" is a treacherous word. The roentgenologist, if he mentions it, usually thinks of pathologic activity, the clinician is prone to construe his report as indicating clinical activity and naturally resents an intrusion. It is safer to report the pathology as accurately as we may from the film, letting this carry its own inference. Lawrason Brown has drawn clearly the distinction between clinical and pathologic activity.

The oblique views, to demonstrate calcified tracheobronchial glands, as stressed by Doctor Pindell, are necessary to thorough examination of the child.

Doctor Pindell is to be congratulated upon his paper and upon his opportunity to play a vital part in a campaign which promises much in the control of tuberculosis.

CHESLEY BUSH, M. D. (Livermore).—Doctor Pindell has had a great deal of experience with tuberculosis and has made a careful study of his work. His ideas

are most sound. I have seen some of his latest x-ray technique on chests of children, and the films are as perfect as can be obtained today.

He stresses the importance of x-ray studies in diagnosis and treatment. I would like to add my commendation of this. Only today I have seen a young university student who has a slowly advancing lung lesion as seen by the serial x-ray, without any physical signs or clinical symptoms of being ill. In fact she appears to be physically better today than six months ago. And yet we must conclude that she has an active tuberculosis requiring a complete overturning of her life for the next year or more. One dealing with tuberculosis nowadays must have as much expertness in interpreting films as used to be required in listening to chests, just as in the future the tuberculosis man will be doing specialized surgery.

This importance of x-ray studies is raising a large economic problem. Substitution of routine screen examinations by some industrial and insurance companies does not answer the problem completely, although it decreases the percentage of error. The screen does pick out proliferative lesions fairly well—but it does not show early exudative lesions which are the most menacing to the health and life of the patient. We are continually seeing applicants for life insurance who break down with tuberculosis a few months after receiving a policy and on whom the companies are lavishing disability payments that might have been saved to them by an x-ray film at the original examination. Routine examinations of tuberculous positive children and health examinations of adults are not complete without an x-ray and the average person cannot afford to pay the extra fee. Public health authorities will have to meet this situation. The general public is beginning to realize the importance of x-ray and it is not now uncommon to have a patient request an x-ray and feel that a chest examination is incomplete without one. The suggestion has been made that a governmental laboratory furnish x-rays as is now done with the Wassermann reaction. This is only another of the economic complications of modern medicine.

The extensive work being done in the "contact plan" of Los Angeles County is a lesson to other tuberculosis associations. The high percentage of tuberculosis found in the groups quoted by Doctor Pindell is astonishing inasmuch as the results are higher than quoted usually in similar groups in this country. It is also interesting to note that the tuberculosis found among the children in the health camps is no higher than that found amidst the school population groups, showing the fallacy of picking out children for these camps by the usual methods.

However we must remember that a negative film does not rule out tracheobronchial tuberculosis in a tuberculin positive child. It simply rules out the presence of parenchymal lesions. It is of great importance to rule out these lesions, though, because it is in this type of child that we recover the tubercle bacillus and they may be dangerous to other children as well as needing extra care themselves. Doctor Seifert is right in saying that in adolescents and adults a negative film means a great deal. Rarely we find a positive sputum in an adult with a negative film, but is so rare that it is to us a curiosity.

Doctor Pindell suggests the question "Is a child better off for a mild degree of tracheobronchial infection?" The answer lies at the root of all our tuberculosis work and we are awaiting the decision.

A. C. Siefert, M. D. (Merritt Hospital, Oakland).—It is my desire to express to Doctor Pindell my admiration for his really masterful exposition of the problems of the diagnosis of pulmonary tuberculosis as they concern the roentgenologist. If more roentgenologists would speak with such competence, experience, logical clarity, and best of all, courage of conviction, one would hear less often the complaint that roentgenology is not treated with the proper respect by the clinical specialties.

Concerning the subject matter of Doctor Pindell's paper, I so thoroughly agree with him that there is no necessity to repeat, on my part, what he has already said, and better said than I could. Only two or three points, however, I would discuss:

As regards the value of the negative roentgen examination in children I would say that it does not prove positively that there is no tuberculous infection, especially of the tracheobronchial lymph glands. In adolescents and young adults, on the other hand, I think, the negative roentgenogram is of considerable diagnostic value and would set my face absolutely against labeling individuals with negative roentgen findings and equivocal clinical symptoms and physical findings, as "tuberculous." These patients should be kept under observation, and special diligence be used to ferret out focal infection and to remove such foci. Frequently, on such removal, clinical symptoms will disappear. If not, careful observation and frequent reëxamination will produce the evidence of tuberculosis.

Concerning the use of the word "activity" in pulmonary tuberculosis I cannot share the author's dislike of it, nor admit the clinician's contention that the roentgenologist has no right to use it. Pulmonary tuberculosis may be said to be in a state of activity as long as the interaction between the tubercle bacillus and the infected organism is in progress in either direction. The manifestation of activity is expressed in terms of pathologic physiology and in terms of pathologic anatomy. The anatomical changes are of an unstable character, *i. e.*, they may go on to complete fibrosis and calcification in one direction, or they may go on to the extremes of tissue destruction in the other direction. It is quite conceivable, as Doctor Pindell has shown, that these anatomical changes of an unstable character may be demonstrated and their instability recognized by the roentgenologist, while the accompanying pathologic physiologic processes may be too slight to be appreciable by the ordinary methods of clinical examination. Perhaps, in the future, reliable immunologic and biochemical tests will be developed to make such "symptoms" manifest. At any rate, to quibble over "pathologic" and "clinical" activity is not to the patient's advantage. If the roentgenologist can, as Doctor Pindell contends, demonstrate and recognize so-called "pathologic activity," it becomes, to my mind, the clinician's duty to utilize this evidence in the interest of his patient even in the absence of clinically demonstrable symptoms. Who of us has not seen clinically arrested or latent cases of tuberculosis, or whatever expression be used, flare up with terrifying suddenness and go on to a fatal conclusion.

The final paragraph of Doctor Pindell's paper concerning the form of the roentgenologist's report to be rendered to the clinician meets strongly with my approval. Let us make our description, whenever possible, in terms of pathologic anatomy, not in fanciful comparisons based upon meteorology, dendrology, etc., which certainly do not add to the clarity of the clinician's conception of the pathology present, he being already hard put to properly interpret various râles, impaired resonances, etc. At the end of the roentgenologist's description should be expressed a clear-cut diagnostic opinion, not the usual hedging. The clinician should remember that this is an opinion and not accept it as a statement of absolute fact, for "errare humanum est." Let the clinician remember that the proverb applies to him, too, and not resent his colleague's expression of opinion but utilize it to the patient's advantage.

Doctor Pindell (Closing).—Concerning the negative reports of films, the writer feels that it is one of the most important parts of the campaign. Seriously considering the economic factor, and at the same time realizing that the roentgen examinations are not

infallible, the writer still believes that there are not nearly enough x-ray examinations being made. When routine x-ray examinations are not made, it is surprising how many patients are diagnosed as tuberculous and even sent to a sanitarium without the disease.

Referring to Doctor Carter's question of whether or not tracheobronchial tuberculous lesions are of any great significance in a preventive program, the writer does not consider these lesions a major problem as tracheobronchial tuberculosis is not a contagious disease, and the patients who have it seldom die. What he does consider the all-important part is that more stress must be laid on the recognition of tuberculosis in the adult, for he is the one that infects the child. Theoretically speaking, if we were to isolate all adults who have tuberculosis, we would not have tuberculosis in children. Of course we must diagnose the disease early in children and adults in order to save their lives.

The author agrees with Doctor Bush that films should be used instead of screens, or fluoroscopic examinations. The high percentage of tuberculosis that we found might be explained by our careful mode of selecting cases for examination, and the fact that there is a high percentage of Mexicans in our population.

Concerning the use of the word "activity," Doctor Siefert has stressed what the author had in mind, that if we wait until clinical symptoms manifest themselves, the patient many times will be in a dangerous condition. While, with pathologic activity, the disease is usually localized or in its early stages.

THE THERAPEUTIC VALUE OF THE HYPEREXIA BATH

By ARTHUR N. DONALDSON, M. D.
Long Beach

DISCUSSION *by Merrill W. Hollingsworth, M. D., Santa Ana; Henry Mehrtens, M. D., and P. S. Pouppirt, M. D., Stanford University Hospital, San Francisco.*

EVERY important contribution to the literature on the physiology of fever for the past thirty years offers the conclusion that temperature elevation renders a distinct defensive service to the body. It is the physician's experience that usually the patient with the highest temperature is the sickest. Hewlett [1] tells us, however, that this is not an indication that the high temperature is itself an unfavorable form of reaction, but that the disturbing factor is the severity of the infection. In other words, the degeneration of internal organs in the course of febrile diseases is due to the infection and not to the high temperature.

COMMENTS ON THE LITERATURE

MacCallum [2] of Johns Hopkins may be quoted as follows: "The febrile process is a reaction beneficial to the organism and, doubtless, intimately associated with the development of protective substances." MacCallum's observation seems to be substantiated by the work of Rolly and Meltzer,[3] who, led by their theory of the functional value of fever, found that the overheating of the body increased the formation of agglutinins, bacteriolysins, and antitoxins. In another very interesting piece of work conducted by these German investigators, they seem to have fully proved their claim that fever is a defensive function. Two groups of animals were selected and to each was given daily, by subcutaneous route, from one-fourth to one-half of the fatal dose of either staphylococci, pneumococci, or *Bacillus coli communis*. One group was daily heated up to 104 degrees Fahrenheit and held at that temperature for a given period of time. Results: the unheated group all died. The heated group all lived longer than the control, and one-half of them survived.

Hewlett [1] reports an experiment that parallels that of Rolly and Meltzer in results. A hyperthermia was produced in animals through the use of the steam cabinet, or by puncture of the heat centers at the base of the brain, or by the injection of some aseptic pyrogenic material. It was determined that erysipelas and infections from staphylococci, pneumococci, and the diphtheria bacilli ran a shorter and a milder course.

Hewlett also reports that the body temperature of rabbits has been kept at 105.8 degrees Fahrenheit, and over, for weeks at a time without serious damage to the tissues. An interesting sidelight on this evidence of the harmlessness of hyperthermia is the observation by Ott [4] and others that tissue protection in the presence of elevated temperature depends upon an abundant supply of nonnitrogenous energy-producing food. For every increase of one degree in the temperature of the body, heat production increases six per cent. This is supposed to be due to the specific dynamic action of amino-acids. Yet the actual protein destruction in the presence of hyperthermia alone is very small, provided, of course, that nutrition has been properly maintained.

Hewlett [1] quotes Winternitz to the effect that in a hot bath the absorption of oxygen and the excretion of carbon dioxid is far in excess of that observed in an infectious fever, and that the coefficient approached closely to that observed in strenuous muscular exercise. We are reminded by these facts that a fever should not be starved, and that hyperthermia, if used therapeutically, will prove less exhausting if sufficient energy food has been provided to prevent an attack on the body proteins.

CLINICAL OBSERVATIONS NOTED IN THE LITERATURE

One of the oldest of therapeutic procedures is the hot bath. We have recently learned, however, that if we make the bath hotter and keep the patient in longer, the bath will prove of far greater therapeutic value than our previous experience has indicated. Schamberg,[5] Frazier,[6] Hollingsworth,[7] Brown,[8] and Mehrtens [9] have all contributed to the literature within the past four years and, with one exception, report results that are so convincing that we are compelled to recognize the hyperpyrexia bath as a measure of widening therapeutic value. The one exception is Hollingsworth of White Memorial Hospital, and his technique is so obviously at fault that his conclusions are worthless.

Schamberg [5] and Frazier [6] report favorably on the treatment of experimental syphilis in rabbits by the use of baths at 113 degrees Fahrenheit.